
Environmentally Sensitive Facilities:

CANADIANA

Remote Tourism Case Studies

MAR 14 1995

**Alberta Economic Development and Tourism
Development Services Branch**



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TO WHOM IT MAY CONCERN

Alberta Economic Development and Tourism is pleased to release this study titled: "Environmentally Sensitive Facilities: Remote Tourism Case Studies".

The provision of basic services such as sewer, water and power to those tourism developments in remote locations presents both environmental and economic challenges.

In an effort to provide concrete examples of such challenges, Alberta Economic Development and Tourism developed this report. It comprises information on alternative and minimum impact technologies used by 15 tourism facilities across Canada. The information was obtained through telephone and fax surveys. Consent to publish the findings was obtained from the respective operators.

This report complements a parallel study "Alternative and Minimum Impact Technologies for Remote Tourism Developments", which provides information on a comprehensive range of feasible technologies.

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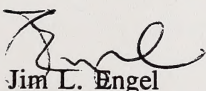
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If you have any comments relative to this report, please contact:

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Yours sincerely,


Jim L. Engel

Assistant Deputy Minister
Small Business and Tourism Development

Environmentally Sensitive Facilities: Remote Tourism Case Studies

**Alberta Economic Development and Tourism
Development Services Branch**

September, 1994

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EXECUTIVE SUMMARY

In Alberta, there is concern that development of new tourism facilities in remote and unserved locations should be appropriate to the surrounding environment, and reflect concern for the environment. Concern is particularly focused on resource conservation related to such systems as energy and water consumption, and waste and sewage disposal.

A range of alternative and minimum impact technologies may be used in the design and operation of new facilities in remote and unserved areas of Alberta, which demonstrate sustainability, low environmental impact, energy conservation and energy renewal, as well as cost effectiveness.

The purpose of this study is to examine remote tourism facilities in Canada which currently use environmentally sensitive technologies, to provide information on the feasibility of the technologies.

The study summarizes basic information on 15 lodge facilities in Canada that are currently using alternative and minimum impact technologies. Information for each operation is organized under the following major headings:

1. Background Information
2. Technologies
3. Year Round Capability
4. Maintenance and Servicing
5. Advantages
6. Disadvantages
7. Market Related Information
8. Supplier/Manufacturer
9. Contact(s)

The choice of comparable facilities for review was based on both secondary and primary research. Information on each comparable was derived from telephone and fax surveys.

Four types of alternative and minimum impact technologies were of interest for this study:

- * **Site Development and Construction Technologies** - Passive solar design with energy-saving features and low energy equipment.
- * **Energy Technologies** - Wind energy, active solar, photovoltaic (PV) solar, and load management.
- * **Waste Management Technologies** - Solid waste management, sewage decentralization and water reuse.
- * **Water Quality and Conservation Technologies** - Reuse of greywater and equipment with low water use features.

While not every comparable demonstrates the use of all four types of alternative and minimum impact technologies, some are leaders in demonstrating each type.

A leader in the application of Site Development and Construction Technologies is the Boyne River Ecology Centre near Toronto, Ontario. This remote building has incorporated several passive solar design energy saving features, such as south facing and triple glazed windows and foam insulation.

A leader in the application of Energy Technologies is Tarryall Lodge, a remote fishing lodge in northwestern Ontario. Prior to installation of a PV - diesel hybrid system, a diesel generator operated 24 hours a day. With this new system, the diesel generator is only turned on once every three or four days for about 10 hours, to recharge the batteries. This new system has resulted in significant cost savings in fuel and maintenance charges.

A leader in the application of Waste Management Technologies is Purcell Lodge, a remote lodge in the Canadian Rockies in British Columbia. Purcell lodge treats waste on-site with a self contained aerobic system of sewage treatment.

A leader in the application of Water Quality and Conservation Technologies is Lake O'Hara Lodge, a remote lodge in Yoho National Park, British Columbia. The lodge uses low volume faucets and showers, as well as a low water volume vacuum toilet.

The material presented in this study is intended to provide tourism proponents and other interested parties with information which may assist them in their overall evaluation of feasible, appropriate technologies and systems for tourism applications.

INTRODUCTION

The tourism industry, like others, is being examined closely for the effects of its activities on the environment. The value of the external environmental resources (both natural and cultural) are quite well recognized. However, there is less widespread knowledge about the use or conservation of resources within a tourism facility, and how to minimize the impact of that facility's operations on the external environment.

In Alberta, there is concern that development of new tourism facilities in remote and unserved locations should be appropriate to the surrounding environment, and reflect concern for resource conservation. Concern is particularly focused on such systems as energy and water consumption, and waste and sewage disposal.

Alberta Economic Development and Tourism is currently researching the topic of alternative and minimum impact technologies which may be feasible in the design and operation of remote facilities, as well as their potential application in the province.

The purpose of this study is to examine comparable remote facilities currently using environmentally sensitive technologies, to help in evaluating how appropriate or feasible the systems are for application in Alberta. A range of alternative and minimum impact technologies which may be used in the design and operation of new facilities in remote and unserved areas of Alberta have been examined. This report summarizes basic information on 15 comparable facilities in Canada that are currently using alternative and minimum impact technologies.

The following provides a range of alternative and minimum impact technologies that the comparable tourism facilities may be using, by technology category:

Site Development and Construction Technologies:

1. Low Energy Facility Designs and Alternatives (Passive Solar Design)

Solar design with energy-saving features:

- insulated night shutters
- double or triple glazing
- removal of most north and west facing windows
- windbreaks and/or earth berms to the north and west of buildings
- building into the south face of a hill
- adding extra insulation
- improving airtightness

2. Low Energy Equipment:

- Telecommunications
- Appliances
- Lighting
- Heating

Energy Technologies:

1. Wind Energy
2. Micro-Hydro Electric
3. Solar (active, photovoltaic (PV))
4. Co-Generation (on-site power generation)
5. Geothermal Energy
6. Direct Digital Control (DDC) Systems
7. Load Management (eg. peak demand control, outside air reductions)
8. Recovery of Waste Energy - (e.g. heat pump, exhaust systems heat recovery)

Waste Management Technologies:

1. Solid Waste Management (e.g. reduce, reuse, recycle, recover)
2. Sewage Decentralization (e.g. composting toilets)
3. Composting Food Wastes
4. Incineration
5. Water Reuse (Greywater)

Water Quality and Conservation Technologies:

1. Re-Use of Greywater
2. Equipment with Low Water Use Features (e.g. low flush toilets, low flow shower heads, sensitized faucets)

METHODOLOGY

Approach

A literature review and personal contacts were used to identify remote facilities in Canada demonstrating leadership in using environmentally sensitive technologies. Subsequent telephone discussion with each of the operators of the 15 facilities provided basic information on the alternative and minimum impact technologies used. With this broad information, a set of general questions was developed as a survey, to obtain more specific information on the facilities' use of alternative and minimum impact technologies (Appendix A). Each facility was administered a survey by fax which focused on the specific technologies they used, rather than on a large comprehensive survey so as to increase responses. A follow up by telephone and fax was used to fill in gaps or verify information where required. All lodge operators were provided with a final draft related to their operations' use of low impact technologies for review and possible modification.

Information Organization

The choice of remote facilities for the review was based on the definition of alternative and minimum impact technologies, and formalized through primary research. Information on each facility was derived from telephone and fax surveys, and the level of detail reflects the information provided by the contacts. While gaps may exist in the information base for various comparables, through the contact names provided, additional information may be acquired.

Information for each operation is organized under nine major headings:

1. Background Information
2. Technologies
3. Year Round Capability
4. Maintenance and Servicing
5. Advantages
6. Disadvantages
7. Market Related Information
8. Supplier/Manufacturer
9. Contact(s)

Selected Tourism Facilities

The following 15 comparable remote facilities using alternative and minimum impact technologies are described in the report:

1. Wells Gray Park Backcountry Chalets, British Columbia
2. Sheep Mountain Visitor Information Centre, Yukon
3. Sorcerer Lake Lodge, British Columbia
4. Tarryall Lodge, Ontario
5. Peterson's Point Lake Lodge, Northwest Territories
6. River Cove Campground, Alberta
7. Mount Assiniboine Lodge, British Columbia
8. Selkirk Lodge, British Columbia
9. Boyne River Ecology Centre, Ontario
10. North Knife Lake Lodge, Manitoba
11. Arctic Watch Lodge, Northwest Territories
12. Mistaya Lodge, British Columbia
13. Purcell Lodge, British Columbia
14. Alpine Huts, Alberta and British Columbia
15. Lake O'Hara Lodge, British Columbia

Table 1: Summary of Alternative and Minimum Impact Technologies Used by Remote Facilities

Remote Facilities	Site Development and Construction Technologies	Energy Technologies	Waste Management Technologies	Water Quality and Conservation Technologies
Wells Gray Park Backcountry Chalets	X			
Sheep Mountain Visitor Information Centre	X	X		
Sorcerer Lake Lodge	X	X		
Tarryall Lodge	X	X		
Peterson's Point Lake Camp		X		
River Cove Campground		X		
Mount Assiniboine Lodge	X	X	X	
Selkirk Lodge	X	X	X	
Boyne River Ecology Centre	X	X	X	
North Knife Lake Lodge	X	X	X	
Arctic Watch Lodge	X	X	X	
Mistaya Lodge	X	X	X	X
Purcell Lodge	X	X	X	X
Alpine Huts			X	
Lake O'Hara Lodge			X	X

WELLS GRAY PARK BACKCOUNTRY CHALETS

Background Information

Wells Gray Park Backcountry Chalets are located at Trophy Mountain, in the Cariboo Mountain Range of British Columbia. The two chalets have been in year round operation since 1987, and can accommodate 12 people. Access to the chalets is by helicopter, snow cat, or on foot from Clearwater. Activities available include hiking, skiing, fishing, and wildlife viewing.

The chalets were constructed with heavy insulation to reduce the heating costs in winter.

Technologies

Site Development and Construction Technologies:

The chalets are constructed with 8 in styrofoam insulation.

Year Round Capability

The extra insulation keeps the chalets heated year round.

Maintenance and Servicing

There is no maintenance or servicing required.

Advantages

Cost savings are significant with the heavy insulation because the heating requirement with propane is minimal. As well, safety is improved with the minimum use of propane.

Disadvantages

No disadvantages were noted.

Market Related Information

Visitation is mostly from Germany, Great Britian, United States, British Columbia and Alberta.

Supplier/Manufacturer

Nascor from Langley, British Columbia developed the prefabricated styrofoam insulated building.

Contacts

Tay Briggs
Wells Gray Park Backcountry Chalets
Box 361
Clearwater, British Columbia
V0E 1N0
Telephone: (604) 587-6444

Nascor British Columbia
Langley, British Columbia
Telephone: (604) 888-3701

SHEEP MOUNTAIN VISITOR INFORMATION CENTER

Background Information

The Sheep Mountain Visitor Information Center is situated in Kluane National Park, Yukon, and is in operation from May until October. It is located adjacent to the Alaska Highway at the base of Sheep Mountain in the Rocky Mountains. Kluane Lake, the largest lake in the Yukon, is located on the other side of the information center. Wildlife commonly found in the area include Dall Sheep and Grizzly Bears. Hiking, wildlife viewing, fishing and primitive camping are popular summer activities. Cross-country skiing is popular in the winter.

The Sheep Mountain Visitor Information Center was built in the spring of 1989, and designed to incorporate Photovoltaic (PV) solar energy to provide electricity because grid power was unavailable. As well, a diesel generator was found to be unsuitable because the National Parks Service wanted to demonstrate that a facility in Kluane National Park could be built with low environmental impact and energy conservation.

Technologies

Site Development and Construction Technologies:

The Sheep Mountain Visitor Information Center uses a combination of 12V DC low energy lighting and 115V AC fluorescent fixtures.

Energy Technologies:

The Sheep Mountain Visitor Information Center uses hybrid energy generation. This consists of a PV array, lead acid storage cells, charge and control electronics, DC to AC converter, and a propane fired generator. The system is operated at a typical draw of 2kW, and is in operation five months of the year.

Year Round Capability

Although the information center only operates in the summer season, the hybrid energy generation system can operate year round. However, there is the potential of batteries freezing in extreme cold temperatures when there is no charge going through them. Therefore, the propane generator would need to be used for battery charging if winter use was proposed.

Maintenance and Servicing

The storage cells must be topped up with distilled water because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained.

Advantages

The hybrid energy generation system requires minimal maintenance, does not pollute and operates noiselessly. The system is also highly reliable and requires only sunlight and propane for fuel. After payback of this system, annual cost savings will be significant.

Disadvantages

The only disadvantage noted by the Parks Service is the "relatively high capital costs of the system." However, the payback is approximately four years.

Market Related Information

Visitation is mainly from the United States and Europe. Visitors are generally impressed by the hybrid energy generation system.

Supplier/Manufacturer

Photron Canada out of Colinton, Alberta is the supplier of the hybrid energy generation system.

Contacts

John Netherton
Kluane National Park
P.O. Box 5495
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T0G 0R0
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SORCERER LAKE LODGE

Background Information

Sorcerer Lake Lodge accommodates 12-16 people, and is situated high in the Selkirk Mountains, approximately 3 km beyond the northern boundary of Glacier National Park in British Columbia. It is located behind Sorcerer Lake and faces the Nordic Mountain, and its surrounding glacier. Access to the lodge is by helicopter, and then a 25 km hike through the Ventego Valley. The lodge offers backcountry skiing from January until April.

Sorcerer Lake Lodge was built in 1991, and designed to incorporate a PV - diesel hybrid system because of the high cost of fuel, and air freighting fuel. Safety was also a consideration in using the hybrid system because the other alternative would be propane, and it offers a potential fire hazard. Low energy fluorescent lighting was also installed to reduce costs, since the bulbs last longer and are more energy efficient.

Technologies

Site Development and Construction Technologies:

With the exception of 1/10V light, all of the lights are low energy fluorescent, at Sorcerer Lake Lodge.

Energy Technologies:

A PV - diesel powered hybrid system is in use to provide electricity for the lodge. During the months of January and February, when there is little sunshine, the diesel powered generator is used every second or third day for 1/2 hour to recharge the batteries to provide electricity to the lodge.

Year Round Capability

The technologies are capable of functioning in all seasons.

Maintenance and Servicing

The diesel generator requires regular maintenance and greasing approximately once a year. The batteries require replacement every three years. As well, distilled water must be added to the storage cells because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained.

Advantages

Using the PV - diesel hybrid system has resulted in significant cost savings as minimal fuel is required, and air freighting fuel is infrequent. As well, there are no storage costs associated with fuel. Safety is increased because there is less of a fire hazard, since propane is not used. In addition, the system is almost maintenance free, clean, quiet and is enjoyed by the guests.

Disadvantages

The only disadvantage noted was the initial high capital cost. However, payback is approximately four years.

Market Related Information

Visitation is mainly from the Pacific NorthWest and Canada West, such as Alberta, British Columbia, Washington, Oregon, Montana and Idaho. Visitors are impressed with the PV - diesel hybrid system.

Supplier/Manufacturer

Soltek from Victoria, British Columbia is the supplier of the PV - diesel powered hybrid system.

Contacts

Wayne Bingham
Iconoclast Development
Box 175
Golden, British Columbia
V0A 1H0
Telephone: (604) 344-2326

Soltek Solar Energy Ltd.
2 - 745 Vanalman Avenue
Victoria, British Columbia
V8Z 3B6
Telephone: (604) 727-7720

TARRYALL LODGE

Background Information

Tarryall Lodge is a remote fishing lodge located on the northeast edge of Catherine Lake in northwestern Ontario. This lodge, built in 1961, accommodates 50 people in the cabins, and is in operation from May until September. In addition to fishing, Tarryall lodge offers canoeing, sight-seeing, swimming and berry picking.

The lodge is located 6 km from the electric grid, but used to be powered by a diesel generator that operated 24 hours a day. However, high cost prompted the owner to investigate renewable energy alternatives. Therefore, a PV - diesel hybrid system was installed.

Technologies

Site Development and Construction Technologies:

Tarryall lodge now uses efficient 12V fluorescent lights. A smaller motor was installed in the water pump, timers were installed on exterior lights, and the freezer is moved outdoors in the winter.

Energy Technologies:

Prior to the installation of a PV - diesel hybrid system, the lodge's electrical generating system consisted of 2 diesel generators (a 7.5 kW main generator and a 3 kW back-up generator). The hybrid system now includes a 564 Wp PV array, a bank of twenty-four 2.2V deep-cycle batteries and the 7.5 kW diesel generator.

During periods of low sunshine, the use of the diesel generator is reduced by drawing power from the bank of batteries. The diesel generator is only run when the batteries are drawn down. Diesel consumption has been reduced significantly as a result of this system. Instead of running the diesel generator on a continuous basis, it is only turned on once every three or four days for about 10 hours to recharge the batteries.

Year Round Capability

The PV - diesel hybrid system can operate year round. In winter, the PV modules produce more power during cold weather.

Maintenance and Servicing

Since the diesel generator is used less, it requires fewer oil changes, overhauls and repairs, therefore extending the generators life. The batteries require cleaning a few times a year. As well, distilled water must be added to the storage cells because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained.

Advantages

Total first-year savings in fuel and maintenance charges totalled approximately \$6,950. In addition to the cost effectiveness of the PV - diesel hybrid system it is quieter, cleaner and requires less maintenance and servicing. As a result of implementing the site development and construction technologies, the average daily power use has been reduced by several kilowatt hours.

Disadvantages

The initial cost of installing the PV - diesel hybrid system is high. Tarryall paid half of the \$36,000 required to install the system; the remainder was paid by Energy, Mines and Resources Canada, the Ontario Ministry of Energy and the system supplier. Payback is five years with continuous fuel savings from the outset.

Market Related Information

Visitation is mainly from Winnipeg and the northern United States. The owner noted that "people from cities appreciate the PV - diesel hybrid system the most because it is quiet and there is less pollution."

Supplier/Manufacturer

Photron Canada out of Colinton, Alberta is the supplier of the PV system. Ron White from Tarryall lodge is also currently a dealer for Photron Canada.

Contacts

Ron White
Tarryall Resort
Box 400
Keewatin, Ontario
POX 1C0
Telephone: (807) 543-4000

Ron LaPlace
Photron Canada
P.O. Box 136
Colinton, Alberta
T0G 0R0
Telephone: (403) 675-2586

PETERSON'S POINT LAKE CAMP

Background Information

Peterson's Point Lake Camp is located on the west end of Point Lake at the western edge of the Boreal Forest and the Tundra, 346 km north of Yellowknife, Northwest Territories. This camp is the only tourist facility at Point Lake, and is accessible by float plane. The camp accommodates 10 people, and is in operation July and August. The camp offers opportunities for fishing, hunting, and wildlife viewing.

The owners decided to take advantage of the 24 hour a day sunlight, and installed a PV system three years ago. Prior to the installation of this system, electricity was unavailable at the camp.

Technologies

Energy Technologies:

A PV system is used to provide electricity to the camp. This consists of solar panels and batteries. The shower, fridge and kitchen are powered by the batteries which charge from the solar panels. For example, the shower runs off a 12V battery.

Year Round Capability

Although the camp operates only in the summer season, the PV system has the capability of operating year round.

Maintenance and Servicing

Distilled water must be added to the storage cells because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained.

Advantages

The PV system has several advantages over a diesel generator which would be an alternative to this system. There is long term cost savings because both fuel and its air freighting is not required with a PV system. In addition to cost savings the system is quieter, cleaner and requires less maintenance and servicing than a diesel generator.

Disadvantages

No disadvantages were noted.

Market Related Information

Visitation is mainly from United States, Germany, Austria, Switzerland, Alberta and British Columbia. The camp receives 60 visitors per year for naturalist activities, and 60 visitors per year for hunting excursions.

Supplier/Manufacturer

Loto from the United States is the supplier of the PV system.

Contact

Jim Peterson
Peterson's Point Lake Lodge
The "J" Group Ltd., Box 447
Yellowknife, NWT
X1A 2N4
Telephone: (403) 920-4654

RIVER COVE GROUP CAMPGROUND

Background Information

River Cove Group Campground is located in the Elbow River Valley of Kananaskis Country in Alberta. The area is characterized by a variety of landscapes, such as grasslands, aspen parkland, subalpine forest and high alpine. Wildlife commonly found in the area include bighorn sheep, elk, moose, deer and bears. Camping, hiking, wildlife viewing, fishing, cycling and horseback riding are popular summer activities. Cross-country skiing and skidooing are popular winter activities.

Many of the campgrounds and day-use facilities in Kananaskis Country have toilets and shelters. However, most have no electricity supply for lighting. In 1988, two PV powered fluorescent lighting systems were installed at River Cove Group Campground to enhance the services, by extending their use to after dark. This initiative was encouraged and partly funded by Energy, Mines and Resources Canada under the Enerdemo Program.

Technologies

Energy Technologies:

One PV system was installed at a public shelter. This system consists of three Solarex MSX53 PV panels, 250 Ah of Exide batteries, and fluorescent lighting. The system is triggered by a motion sensor and is turned off by a time delay switch.

The second PV system was installed on a public toilet building. It consists of Solarex panels and 200 Ah of GNB Watchman batteries. This system is also triggered by a motion sensor and is turned off by a delay switch.

Year Round Capability

The PV system is capable of functioning year round. However, the batteries may freeze in extremely cold temperatures.

Maintenance and Servicing

Batteries require cleaning a few times a month. Distilled water must be added to the storage cells because the lead acid configuration in the batteries when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained.

Advantages

Installation of the PV system is more cost effective than the alternative of connecting to a utility grid. Once the system is installed there is no operating cost. Other advantages include the simplicity and reliability of the system, and the minimal maintenance required.

Disadvantages

The initial capital cost of the PV system is high. However, Kananaskis Country only paid approximately half of the \$38,940 required to install the system; the remainder was paid by Energy, Mines and Resources Canada.

The PV system was not working well for the first three years because there were defects in the system's parts. With the exception of the solar panels, other parts of the system were replaced. However, difficulty arose in finding replacement parts since the supplier was no longer operating.

The batteries freeze in extreme cold temperatures. The system also attracts negative attention, and rocks are occasionally thrown at the solar panels.

Market Related Information

Visitation is primarily from the City of Calgary. It was noted that "younger visitors, such as scout groups, are more interested and curious in the PV system, and this leads to questioning of the park staff about how the system works and its benefits."

Supplier/Manufacturer

N/A

Contact

Bob Jenkins
Kananaskis Country Head Office
#100 1011 Glenmore Trail S.W.
Calgary, Alberta
T2V 4R6
Telephone: (403) 297-3362

MOUNT ASSINIBOINE LODGE

Background Information:

Mount Assiniboine lodge is located at 7,200 ft in Mount Assiniboine Provincial Park in British Columbia. The lodge accommodates 30 people, and access is by helicopter. The lodge is in operation from mid-February until mid-April, and from the end of June until the end of September. Hiking is popular in the summer season, and cross-country skiing and telemark skiing are popular in the winter season.

Mount Assiniboine Lodge was built in 1928 by the Canadian Pacific Railway (CPR). Since new ownership in 1983, several retrofits have been made to make the lodge more energy efficient and environmentally sensitive.

Technologies

Site Development and Construction Technologies:

Prior to 1983 there was no insulation in any of the buildings. Since then the buildings have been re-roofed and fully insulated. The single pane windows have been replaced by sealed double-glazed units.

A 12V light system has been installed in the bedrooms and kitchen in the main lodge. Seven rooms have been retrofitted with low energy fluorescent lights. As well, a 1-12V super-insulated electric fridge is used.

The 30 gal water tank in the kitchen was replaced with two Japanese "on demand" water heaters. The heaters (Paloma heaters) are extremely efficient. Twenty people can shower daily for two weeks on one 150 lb propane tank - this is much more efficient than a hot water tank.

The old root-house under the lodge living room has been restored. The root-house is used as an alternative to a refrigerator to keep food a few degrees above freezing, year round.

Energy Technologies:

A solar panel has been installed at the lodge to charge the radio-phone. As well, solar panels have been installed on the mountain where the radio-repeater is located.

A small hydro-electric system is in place. This consists of a Pelton wheel with inverters to change the voltage from 12V to 110V power, and a battery bank of 6 500 amp batteries. The Pelton wheel offers continual power to charge the batteries that run the electrical lights, phone system and kitchen appliances. A small Honda generator is used as a back-up in case the Pelton wheel fails, or in case there is no running water in the winter.

Waste Management Technologies:

Recycling is very active. Plastic, bottles and tins are flown out to be recycled. The money that is made from recycling bottles supports the lodge's two foster children in India and South America. Two pigs are kept at the lodge which eat all the food waste.

Year Round Capability

The technologies are capable of functioning year round. However, in extreme cold temperatures, the water may freeze in the water line which is 2 km in length. When this occurs the Pelton wheel will not function. Therefore, the generator must be used 1-2 hours a day to charge the batteries.

Maintenance and Servicing

The batteries that power electricity require cleaning a few times a year. Distilled water must be added to the storage cells because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained.

Advantages

Implementing the technologies (solar panels, Pelton wheel, low fluorescent lights, water heaters and building insulation) has resulted in significant cost savings because less propane is required, and air freighting propane is less frequent. The fire hazard has also been reduced because less propane is used. The root-house is a pollution free alternative to a large, costly and noisy generator with exhaust.

Disadvantages

No disadvantages were noted.

Market Related Information

Visitation is mainly from Europe (Great Britain, Germany), United States, British Columbia and Alberta. The lodge operates at 50 - 60% capacity in the winter season, and 100% capacity in the summer season. Visitors are pleased with the quiet surroundings of the lodge, as a noisy, diesel generator is not used. Guided naturalist hikes that offer explanations of internal conservation measures are available daily. For example, it is explained that formerly Mount Assiniboine Lodge was once supplied by horse. That practice has changed to helicopters supplying the lodge because horses caused too much trail damage.

Supplier/Manufacturer

Backwoods Solar Electric Systems from Sandpoint, Idaho is the supplier of the energy technologies, and low energy equipment used.

Contacts

Barb Renner
Mount Assiniboine Lodge
In Care of Box 1527
Canmore, Alberta
T0L 0M0
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Steve & Elizabeth Willey
Backwoods Solar Electric Systems
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Sandpoint, Idaho
83864
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SELKIRK LODGE

Background Information

Selkirk Lodge is a remote lodge located at 7,200 ft on a high ridge facing the Justice Glacier in British Columbia. The lodge accommodates 12 people, and access is by helicopter from Albert Canyon which is located 32 km west of Roger's Pass. The lodge is in operation from January to April for ski touring.

A PV system was installed to reduce the fire hazard from using propane. A propane toilet was recently installed because the owners were concerned with handling potentially pathogenic human wastes.

Technologies

Site Development and Construction Technologies:

Selkirk lodge is constructed with R 20 walls and an R 40 roof which provide heavy insulation.

Energy Technologies:

Selkirk lodge uses PV solar energy to provide electricity to the lodge. Four solar collector panels charge 4 deep cycle RV batteries, which run 12V fluorescent lights, the radio and telephone.

Wood heat includes 1700 ft² with one RSF wood stove which acts as an efficient heater.

Waste Management Technologies:

A propane toilet has recently been installed. Although it uses quite a large amount of propane, it can reduce the body wastes of a dozen people to a few ounces of inert ash.

Year Round Capability

The alternative technologies are capable of functioning year round.

Maintenance and Servicing

Distilled water must be added to the storage cells because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained. The batteries require replacing within the decade.

Since the propane toilet is quite new, it must be dialed to get the gas/oxygen mix at the optimum for the greatest amount of heat to reduce the waste. As soon as it is dialed, maintenance is minimal.

Advantages

With installation of the PV system, light quality has improved, and the fire hazard has decreased because propane is not used for electricity. Also, there are no operating costs. Other benefits of the PV system include: clean, efficient, and maintenance free technology.

Benefits from using the propane toilet include less frequent helicopter service (service is only once a year to fly in the propane). Also, there are no pathogenic wastes to handle.

Since the lodge is heavily insulated, the heating requirement is minimal. Wood heat offers the advantage of being the least expensive means to heat the lodge, and it offers hot water throughout the winter.

Disadvantages

The capital and installation costs of the PV system are high. According to the owner, "it would take a lot of coleman fuel to recover the cost of buying and installing the system."

There are a few problems with the propane toilet which have to be worked out. For example, the propane toilet on occasion does not decompose the waste, and the waste must be flown out. As well, on occasion, the propane toilet reduces the waste to a dry duffy material. However, considering the high altitude of this lodge, the owner feels the propane toilet is the most effective system for dealing with human waste. Flying out waste is costly, and creating an out house pit latrine would be difficult at 7,200 ft on the edge of an icefield. The owner noted: "if I can make the toilet function as it is supposed to, it will be wonderful."

Market Related Information

The majority of visitors come from Alberta, British Columbia and the western United States. The owner noted: "the green technologies are favourably viewed by visitors."

Supplier/Manufacturer

The propane toilet system, and the RSF wood stove was purchased from Storburn of Ontario. The PV system was purchased from Solar Innovations, Inc. of Calgary.

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BOYNE RIVER ECOLOGY CENTRE

Background Information

The Boyne River Ecology Centre is approximately a 1 1/2 hour drive north of Toronto through the Caledon Hills. This building, which is part of Boyne River Natural Science School, is owned and operated by the Toronto Board of Education. Construction was initiated to compliment the existing environmental education curriculum and to generate interest in the public. The ecology centre was built to demonstrate principles of sustainability, low environmental impact, energy conservation, energy renewal and healthy construction.

Technologies

Site Development and Construction Technologies:

The Boyne Centre's 16 sided form offers many energy related advantages. These include the following:

- * the rounded form offers the most efficient way to warm the building using a central fireplace;
- * it allows much of the building's perimeter to be earth-sheltered;
- * the centre's nondirectional plan eliminates the need for corridors and space-consuming energy.

The centre is a thermally efficient building envelope of glass and wood. The roof is constructed of sod, and an earth embankment wraps the north-facing half of the building. Thermal losses are reduced with below-grade insulation on the walls, floor perimeter, and footings. Most of the exposed surfaces are south-facing windows, consisting of triple-glazed, double low-E, gas filled units with low-conduction edge spacers and insulated frames. The building is extremely airtight as a result of a structural air barrier, foam insulation, gasket detailing, and high quality window seals.

There is a sunny vestibule/mud room on the east side of the building which contributes further to solar gain and provides a good space for drying wet boots. Daylight is achieved from clerestories, light shelves, glass transoms, and translucent fibreglass ceilings in private spaces. Compact fluorescents are used throughout the lodge, and restroom lights are triggered by motion sensors.

Energy Technologies:

Electricity is generated from sun, wind and water. A bank of PV cells are behind the centre, a small hydroelectric generator is in a stream below, and a wind turbine is located on the hill behind the lodge. Electricity from all three sources of energy is stored in large batteries.

Hot water is generated via solar collectors on the south roof and radiators placed beside the fire pit.

Waste Management Technologies:

A solar aquatic waste treatment system, which releases cleaner water than it takes from the site is in place. Raw sewage cycles through four sealed equalization tanks before being pumped into the tallest of 17 clear plastic cylinders arranged in a spiralling configuration. Gravity draws the water from cylinder to cylinder; then into an interior marsh for filtering. Before being released into a display pond where native plants and animals are exhibited, the water passes through an ultra violet sterilizer.

Year Round Capability

The technologies appear to function well through the winter, however the building has not been put through a good winter test since its construction.

Maintenance and Servicing

Maintenance and servicing is minimal. When the natural formation of bacteria does not occur, bacteria must be introduced to the waste treatment system for it to work effectively. The introduction of bacteria is necessary because it assists in the decomposition of raw sewage. The storage cells must be topped up with distilled water because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained. The ashes from the fireplace need to be removed from the big ash pit periodically. The wind turbine tower requires maintenance a few times a year, such as changing the oil, greasing the bearings, adjusting the break and tightening the bolts.

Advantages

A self-sustaining building which demonstrates low environmental impact, energy conservation and energy renewal has been demonstrated. In addition, to cost savings over the long term, minimal maintenance and servicing is required.

Disadvantages

The only disadvantage noted is the costly installation of the technologies. The recovery of initial costs is approximately 5 years, with the advantage of cost savings over the long term.

Market Related Information

The majority of the visitors to this lodge are school children, as well as residents of Ontario. However, visitation does occur from other provinces and countries. Response is very positive from visitors.

Supplier/Manufacturer

Prometheus Energy Systems of Concord, Ontario is the supplier of the energy technologies, and Ocean Arks International of Falmouth, Massachusetts developed the waste treatment system. The building was designed by Douglas B. Pollard Architects, Toronto.

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NORTH KNIFE LAKE LODGE

Background Information

North Knife Lake Lodge is a remote fly-in fishing lodge located 388 km north of Thompson, Manitoba on the southwest edge of North Knife Lake. This lodge accommodates 20 people and is in operation from June until the end of September. In addition to offering fishing, North Knife Lake Lodge offers nature tours, canoe trips, moose hunts and winter adventure outings.

North Knife Lake lodge was built in 1988, and designed to incorporate passive solar design for energy savings, because of the high cost of air freighting fuel for the diesel generator. In 1989, a PV - diesel hybrid system was installed to further reduce the cost of air freighting fuel.

Technologies

Site Development and Construction Technologies:

North Knife Lake Lodge has incorporated the following solar design energy-saving features:

- * triple glazed windows;
- * removal of most north facing windows;
- * built into the south face of a hill;
- * building insulated with 6 inches of fibreglass;
- * roof insulated with 2 inches of styrofoam SM on the roof.

Approximately 60% of the lights are low energy fluorescent. A low energy refrigerator will be purchased in the future.

Energy Technologies:

The PV - diesel hybrid system includes 12 53W panels in an array and 12 batteries. During periods of low sunshine, the use of the diesel generator is reduced by drawing power from the bank of batteries. The diesel generator is run at peak hours (breakfast and dinner) to charge the batteries.

A 3500W wind generator was recently purchased, and will be installed soon. A solar hot water heating system may also be purchased in the future.

Waste Management Technologies:

An agent called Septo Back is used to reduce the percentage of human waste by approximately 50%, so that helicopter transport of the waste to a sewage treatment plant is less frequent and less costly. Food scraps are given to chickens on-site. What the chickens do not eat is composted.

Year Round Capability

The technologies are capable of functioning year round. However, 7 of the 12 batteries froze in extreme cold weather. To prevent this, the diesel generator should run.

Maintenance and Servicing

Since the diesel generator is used less, it requires fewer oil changes, overhauls and repairs. Prior to the installation of the hybrid system, regular maintenance of the diesel generator was required every two weeks. With the hybrid system in place, maintenance of the diesel generator is only required once a year. The PV system only requires cleaning of the batteries twice a season. As well, the storage cells must be topped up with distilled water because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained. The storage cells should be topped up with distilled water once a month prior to shutting down the PV system. To ensure the proper mixing of water and acid the diesel generator should operate before the PV system is shut down, and on the day of the topping up of distilled water.

Advantages

The diesel generator requires less maintenance and servicing. Payback of the PV - diesel hybrid system is three years. The owners are saving about \$10,000 to \$15,000 a year on fuel. In addition to the cost effectiveness and low maintenance of this system, it is quieter and cleaner. As well, the positive responses from visitors also gives the owners satisfaction, and possibly word of mouth advertising.

Disadvantages

There is potential difficulty in finding expertise for repairs of the PV - diesel hybrid system, since this technology is quite new. There is also potential risk of the 110V motors burning out on inverter power if guests use equipment, such as hair dryers, curling irons and clothes washers when the generator is not powered.

Market Related Information

Most visitation occurs from United States, Germany, Great Britain and Canada. The owner noted that, "young people tend to respond to the environmental aspect of the technologies, whereas older people tend to respond to the money savings aspect."

Supplier/Manufacturer

Photron Canada is the supplier of the PV - diesel hybrid system.

Contacts

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ARCTIC WATCH LODGE

Background Information

Arctic Watch Lodge is located 80 km south of Resolute Bay on the north shore of Somerset Island in Cunningham Inlet, Northwest Territories. The lodge accommodates 20 people, and access is by Twin Otter aircraft from Resolute Bay. The lodge is in operation from June until September. Activities available include whale-watching (belugas, narwhals), marine studies, historical and naturalist activities, hiking and expedition support.

Arctic Watch Lodge was built in 1991, and designed to incorporate new technologies as they are developed for both cost effectiveness, and to demonstrate low environmental impact.

Technologies

Site Development and Construction Technologies:

The lodge incorporates the use of energy efficient heaters. The heaters (Lazer and Toyo) are 96-98% efficient.

Low volume faucets and shower heads are used. Low energy fluorescent lighting is also used.

Energy Technologies:

PV solar energy is used to power radio, repeaters and for pumping water. Micro hydro may be used in the future.

Waste Management Technologies:

A composting toilet was used, however it did not work very well because the amount of available heat was insufficient to make the process work.

An unaltered leach pit is used to dissipate human waste. This consists of adding peat moss, leaves, and insects into the leach pit to break down the waste.

Year Round Capability

The technologies are capable of functioning year round, however the lodge only operates during the summer season.

Maintenance and Servicing

Minimal maintenance and servicing is required. The storage cells must be topped up with distilled water because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained.

Advantages

Maintenance and servicing is minimal. Using PV solar energy is cost effective because both fuel and its air freighting is not required.

Disadvantages

No disadvantages were noted.

Market Related Information

Visitors to the lodge are 80% American, 10% German, and 10% Japanese.

Supplier/Manufacturer

Soltek out of Victoria, British Columbia is the supplier of the PV solar power system. Peter Jess of Jessco Operations Inc. in Calgary is the supplier of the site development and construction technologies.

Contacts

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MISTAYA LODGE

Background Information

Mistaya Lodge is located at 6,700 ft on the west slope of the Rocky Mountains, northeast of Yoho National Park in British Columbia. The lodge accommodates 12 people, and access is by helicopter, or a 7 km hike from the end of the Blackberry Forest Access Road 68 km north of Golden. The lodge is in operation from December until April, and from July until September. Hiking and wildlife viewing are popular in the summer, and backcountry skiing is popular in the winter.

Mistaya Lodge implemented several alternative and minimum impact technologies to minimize the long term potential impact on the environment, and to reduce the cost of fossil fuel and its transportation.

Technologies

Site Development and Construction Technologies:

Mistaya Lodge has incorporated wall to ceiling windows in the design of the lodge to provide abundant light during the day. Mistaya lodge also uses 12V DC low energy fluorescent lights with propane backup.

Energy Technologies:

The lodge uses solar panels that run 12V lighting, and an inverter 110V capability for kitchen appliances. A heat exchange unit is also used to provide partially heated fresh air to the lodge. Heat is provided to the 1900 sq ft lodge by a RSF Secondary Combustion Wood/Coal Heater which is very effective and efficient.

Recently a micro-hydro electric system of 400 to 500W has been installed. It also has the same capability of charging batteries for electricity as the solar panels, however it offers more power. It is especially effective in the winter when there is less sun. With the micro-hydro electric system in place, an extra refrigerator and freezer are now running.

Waste Management Technologies:

Mistaya lodge uses a agent called Eco-Clean which reduces the volume of solid waste by up to 50%. This reduces the total quantity of waste which must be flown out.

Water Quality and Conservation Technologies:

Water for the lodge and sauna bath wash-house is supplied by a year round gravity feed system which uses springs near the lodge. Both the lodge and sauna bath wash-house have septic tanks and drain fields with rock pits, that deal with grey water. The wash water drains through a slatted cedar floor and is directed to a floor drain by a waterproof, graded subfloor.

Year Round Capability

The technologies are capable of functioning year round. However, problems have occurred with extremely cold temperatures. For example, water has froze in the water line. Mistaya Lodge incorporated a bleed line into the water line to ensure constant flow of water which now prevents the water from freezing in the water line. As well, water lines near the lodge have been buried deeper and covered with 2 in polystyrene insulation to reduce chances of freezing.

Maintenance and Servicing

Distilled water must be added to the storage cells because the lead acid configuration in the batteries, when charging, emits hydrogen which results in liquid evaporation, and hydrogen levels must be maintained. The micro-hydro electric system had to be serviced upon initial installation because something was blocking the intake valve which caused problems in the system. However, the system is currently working well.

Advantages

The use of solar and micro-hydro electric is very cost effective, because fuel and associated air freight charges are not required. As well, there are no fuel storage costs. The systems are also emission free. Also, there is less of a fire hazard with using solar and hydro-electric as opposed to propane.

Disadvantages

No disadvantages were noted.

Market Related Information

The majority of visitors are from British Columbia, Alberta, Washington, Oregon and Idaho. Upon arrival to the lodge, visitors are given an orientation about the technologies used and their limitations. The owner noted that "response to these technologies is nearly always positive."

Supplier/Manufacturer

Appropriate Energy Systems of Chase, British Columbia is the supplier of the micro-hydro electric system. The remaining energy technologies are supplied by Backwoods Solar Electric Systems of Sandpoint, Idaho. Apparently, "they had the best equipment and price at the time of purchase four years ago (1990)."

Contacts

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Steve & Elizabeth Willey
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PURCELL LODGE

Background Information

Purcell Lodge is a remote lodge located in the Canadian Rockies near Golden, British Columbia which accommodates 33 people. Access to the lodge is by helicopter in the winter and summer, or by foot in the summer. Hiking and wildlife viewing are popular summer activities, and backcountry skiing is popular in the winter.

Purcell Lodge was built in 1991, and designed to incorporate various alternative and minimum impact technologies for cost savings in the long term, and to demonstrate low environmental impact.

Technologies

Site Development and Construction Technologies:

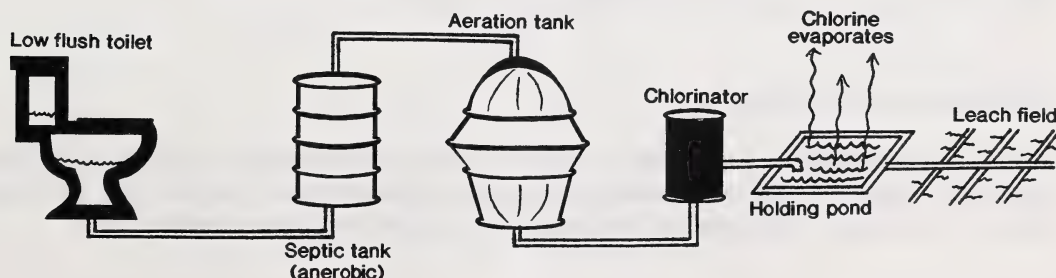
Low energy equipment, such as fluorescent lighting is in use at Purcell Lodge.

Energy Technologies:

A 12 kW hydro-turbine generator provides forced air heat, hot showers and electricity. Purcell Lodge also uses an Electronic Load Control Governor (ELCG) to reduce peak loads. Priority is given to loads that are most important and others must wait until later to get their energy. For example, if the water system (high priority function) turns on, a refrigerator or freezer might temporarily turn off. By using this system Purcell Lodge can get by on approximately 3,000W - which is the power equivalent to two personal hairdryers.

Waste Management Technologies:

Although located in the Alpine Environment, low flush toilets are used at Purcell Lodge. Waste is dealt with on site, rather than transporting the problem. A self contained aerobic system of sewage treatment arrangement is on site. It looks like this:



Step #1:

Waste stream enters a large holding tank which acts just like a septic tank and starts to break down the solids in the system.

Step #2:

Sewage flows to the treatment tank in which aerators breakdown and convert the waste water to harmless effluent.

Step #3:

Filter removes any suspended solids remaining in the stream.

Step #4:

Waste Water Chlorinator destroys viral colonies.

Step #5:

Holding pond allows the chlorine to dissipate.

Step #6:

Treated effluent is dispersed to a subsurface drain field for infiltration into the ground water system.

For this system to work effectively, grease must be trapped, so that it does not clog the treatment system. Therefore, Purcell Lodge has in place a grease separator under the sink. However, it requires extensive maintenance, as the trap must be cleaned about every 7 to 10 days. To minimize loads, biodegradable products are used. For example, guests use the biodegradable soap and shampoo provided. Only grease and non combustible waste is flown out.

Water Quality and Conservation Technologies:

Purcell Lodge uses low flow water using appliances, such as showers, taps and toilets. This reduces the total waste volume which must be treated.

Year Round Capability

The technologies are capable of functioning year round.

Maintenance and Servicing

Minimal maintenance and servicing is required. The self contained aerobic on-site sewage treatment system requires maintenance as the grease separator under the sink must be cleaned every 7 to 10 days. This ensures that the grease does not clog the treatment system.

Advantages

The advantage to using the hydro-turbine generator is that it is clean, quiet and sustainable energy that is available 24 hours a day, 365 days of the year and at little annual operating cost. The only operating cost for the on-site aerobic sewage treatment system is for the energy to power the plant equipment.

Disadvantages

Capital and installation costs are high for the hydro-turbine generator and on-site aerobic sewage treatment system.

Market Related Information

Visitors are mostly from British Columbia, Alberta and United States.

Supplier/Manufacturer

The Electronic Load Control Governor is manufactured by Thomson and Howe Energy Systems.

Contact

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ALPINE HUTS

Background Information

The Alpine Club of Canada operates 19 backcountry huts which are mostly situated within the western mountain National Parks (Banff, Jasper, Yoho, Kootenay and Glacier). Most of the huts implemented a fly-out system of human waste removal which was developed by Parks Canada employees in the 1970's.

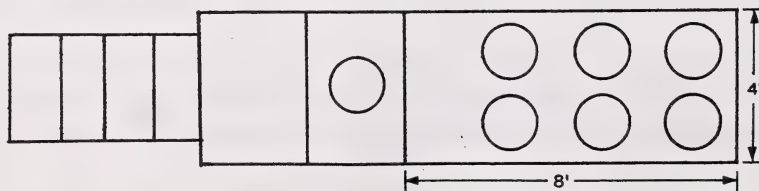
The Alpine Club of Canada has experimented with several waste management systems for huts that have a fly-out system in an attempt to reduce the cost of maintaining the hut system, and make them mostly user friendly. The best system that has been developed is a removable barrel system. This system allows for an increase in the capacity of containment at each location, so that helicopter pick up is only once a year. The Alpine Club of Canada is also currently experimenting with methods that will allow this system to reduce the quantity of wastes.

Technologies

Waste Management Technologies:

The Alpine Club experimented with the use of a composting toilet. However, it was found impractical for the Alpine Huts since constant supervision and daily maintenance is required for this system to work, and the huts are not constantly supervised. The best system for dealing with wastes for the Alpine Huts that have a fly-out system is the removable barrel system. The following is a description of how the removable barrel system works:

The base of the system is made of pressure treated lumber and plywood. The 4ft x 12ft base is covered with a heavy gauge sheet metal on the top for protection which allows the barrels to roll easier. At one end a 4ft x 4ft x 4ft box was built, in which the barrel in use is situated under the end of a sheet metal chute. This is attached to the bottom of the toilet seat and directs waste down into the barrel. The open end of the box is covered by an easily removed piece of treated plywood, which seals the base compartment from the weather. The barrels are set on 3/4in plywood dollies which have 2in rubber wheels. When full, the barrels are rolled out of the box onto the deck where they are covered with the metal lid and closure ring that comes with the paint barrel. At each location there are enough barrels to handle a year of use. The outhouse is often a reused structure with the seat arrangement modified, or a new structure built directly upon the base unit.



Aerial View

The Alpine Club is currently developing new methods that will allow the barrel system to reduce the quantity of waste. Experimental methods to date include:

1. Evaporating urine by using a shallow pan evaporator with a porous fibre pad called an excelsior pad. Solids are dehydrated when they are left in layers of 3 to 4ins. This would entail a urinal only toilet where the urine could be directed into a separate container or piped directly into a evaporator unit.
2. Urine is separated from faeces in the main toilet by placing a horizontal division of heavy metal screen about half way up a 40 gal barrel. A heavy canvas sack, strong enough to hold the solids when they are removed is placed on top of the screen. This acts as a strainer allowing the urine to pass through to the bottom of the barrel. At the bottom of the barrel a 1/2in drain connected to a regular garden hose valve allows the liquids to be piped from the barrel to the evaporator with a black garden hose. When the wastes have thawed after winter, a bacterial activator such as Eco-Clean is added to reduce the solid waste.

Year Round Capability

The removable barrel system works well throughout the year.

Maintenance and Servicing

Maintenance and servicing is only required when the removable barrel system is not used properly. For example, hut users do not always move the barrels when required, therefore allowing sewage to overflow. As well, garbage disposal in the barrels is a reoccurring problem. The barrel changing is often done by hut users. The larger holding capacity also allows less frequent servicing by helicopters and staff.

Advantages

There are significant cost savings due to less frequent helicopter servicing. This system is also user friendly and requires little maintenance or servicing.

Disadvantages

As the waste is not treated on site, there is high cost in flying out the waste by helicopter once a year. Also, the system is not always maintained properly by users.

Market Related Information

The majority of the visitors are from Western Canada. However, visitation also occurs from Ontario, Quebec, United States, Europe and New Zealand. The visitors are generally pleased with the removable barrel waste management system.

Contact

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LAKE O'HARA LODGE

Background Information

Lake O'Hara Lodge is located in Yoho National Park in British Columbia. The lodge accommodates 50-55 people during the summer season, and 16 people in the winter season. Summer access is by reserved bus, and winter access is by ski only. Hiking and wildlife viewing are popular in the summer season, and cross-country skiing and telemark skiing are popular in the winter season.

Lake O'Hara Lodge implemented an on-site sewage treatment system because there was too much commercial greywater to be handled with a conventional septic field. Two septic fields were built, but both failed.

Technologies

Waste Management Technologies:

There is an on-site sewage treatment system plant. Blackwater and greywater are collected separately. The blackwater is transported through a vacuum system and then stored in a holding tank (under vacuum, anaerobic) for up to 24 hours. Once a day a portion of the blackwater is pumped into the greywater collection system (the remaining portion of the blackwater is pumped to a separate sludge holding tank and trucked out to other treatment facilities).

The combined greywater and blackwater is passed through two chambers of a conventional septic tank, and then into an equalization tank. The effluent flows from the equalization tank via a bucket pump (to maintain a steady 24 hour flow) into a Rotating Biological Contactor, a series of rotating corrugated plastic disks on which bacteria can grow. The bacteria treats the sewage.

From the Rotating Biological Contactor the effluent flows through a mixing chamber where alum is added via a dosing pump. The alum assists in the settling of the solid particles in two subsequent clarifying/filtration chambers. The final treated effluent is pumped to a leaching pit 1 km from the site. The sludge which settles out in the clarifiers is pumped every two days into the sludge holding tank (with the excess blackwater) and then trucked out once a month.

Water Quality and Conservation Technologies:

Low volume faucets and showers are used. Low water volume vacuum toilets (1/2 L per flush) are also used.

Year Round Capability

The on-site sewage treatment system works seasonally; winter and summer, and is drained in the spring and fall when the lodge is closed. The on-site sewage treatment system functions better in the summer due to steady flow. In the winter flow is intermittent due to heavier weekend loading.

Maintenance and Servicing

The on-site sewage treatment system can be labour intensive. It needs daily monitoring and regular servicing. Achieving a balance between the blackwater (concentrated due to minimal water dilution during collection in the vacuum system) and greywater is sometimes difficult. Too much blackwater overpowers the bacteria, not enough starves the bacteria. Varying amounts of greywater require correspondingly varying amounts of blackwater addition to provide the correct balance of nutrients for treatment. Maintaining the optimal amount of alum injection is also a challenge. A good deal of effort and experimentation is required to bring the system to a proper balance, but when the balance is achieved, treatment is very effective.

Advantages

The waste management system results in minimal impact on an environmentally sensitive area. Treating the waste on site is less costly than trucking it all out.

Disadvantages

On occasion there are minor odour problems from the treatment plant.

Market Related Information

Visitors are mostly from British Columbia, Alberta, and United States. The lodge operates at or near capacity. The owner noted: "Californians are always interested in the low water volume vacuum toilets."

Supplier/Manufacturer

P.J. Hanna Ltd. of Vancouver British Columbia is the supplier of the on-site sewage treatment plant.

Contact

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ABBREVIATIONS

Ah	Ampere-hours
amp	ampere
AC	alternating current
DC	direct current
ft	feet
gal	gallon
in	inch
ins	inches
km	kilometre(s)
kW	Kilowatt
L	Litre
lb	pound
lbs	pounds
PV	photovoltaic
sq ft	square feet
V	volt
W	watt
Wp	Peak watts

APPENDIX A - STUDY SURVEY

The questions developed for the study survey include:

1. Why did you implement the alternative and minimum impact technologies? Were you trying to solve a particular problem? If so, what is the nature of the problem, and were you successful in solving it?
2. Have you had any problems with maintaining and servicing these technologies? If yes, please specify. Can they be serviced locally?
3. Is more or less maintenance required as a result of implementing the technologies?
4. Are the technologies you are using capable of functioning in both summer and winter? If not, why?
5. What are the cost savings from using the technologies?
6. What are the benefits from using the technologies?
7. What are the disadvantages of using the technologies?
8. Who is the supplier and manufacturer of the technologies?
9. Do your visitors generally know about the technologies in place? If so, what is their response? Do they offer other suggestions to make your facility environmentally sensitive?
10. Are you involved in green marketing of your facility - that is marketing the environmental sensitivity of your facility and programs? If so, how?
11. Where are your visitors from? Does their place of origin make a difference in their response to the technologies? If so, please explain.
12. Are there any visitor characteristics (profiles) which seem to make visitors respond positively or negatively to the alternative technologies in place? If so, please explain.
13. Do you have any further information which would help? If so, please mention.

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